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PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:

"METHOD AND SYSTEM FOR EXCHANGING CONTROL INFORMATION BETWEEN NODES IN MULTIMEDIA NETWORKS"

Applicant:

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The invention is described in the following statement:

The present invention relates generally to the transmission of video, audio and/or data signals between nodes in multimedia networks, and in particular to the exchange of control information between such nodes. The invention is suitable for use in the negotiation of the capabilities of nodes, notably in H.323 and SIP multimedia networks, to transmit out-going information streams and receive and process in-coming information streams, and it will be convenient to hereinafter describe the invention in relation to that exemplary application. It is to be appreciated, however, that the invention is not limited to use in that application.

Multimedia networks, such as those based on ITU-T Recommendation H.323 and the IETF RFC 2543 Session Initiation Protocol (SIP), have the ability to negotiate capabilities between nodes. In the context of the present specification, the expression "nodes" is intended to refer to endpoint terminals for receiving and transmitting user information, network nodes and servers which handle the switching of such information in the network and gateways between adjacent networks. The capability exchange procedures of these networks are intended to ensure that the only multimedia signals to be transmitted are those which can be received and treated appropriately by the receiving node, by making the capabilities of each node to transmit, receive and decode information streams known to the other node or nodes.

To that end, H.323 multimedia networks use the ITU-T Recommendation H.245 protocol, which uses OpenLogicalChannel and/or TerminalCapability messages/structures to exchange information between nodes in the H.323 network about the capabilities supported by these nodes. Similarly, part of the SIP multimedia architecture is the Session Description Protocol (SDP), which is used to negotiate a set of capabilities between nodes in the SIP network. The information which can be negotiated by multimedia negotiation protocols typically includes the type and direction (send only, receive only, or send and receive) of audio, video and data signals, as well as encryption and security information. Once this negotiation has taken place, the user information is transported between the nodes in the format specified by this negotiation. The negotiation can take place at any time, such as during call set-up, during an established session, etc.

Traditional telecommunications networks based on the ITU-T's Signalling System No. 7 (SS7) have no such ability to negotiate capabilities between nodes. Userplane data is simply transported through the core SS7 network in a "pipe" with a bandwidth of 64 kBits/sec multiples based on PCM coding. Accordingly, when multimedia networks, such as H.323 and SIP networks, are separated by traditional fixed or switched

telecommunications networks, such as SS7 networks, across which user information is transferred, nodes in these multimedia networks are unable to negotiate capabilities. A node or gateway interfacing the two types of networks is required to transcode the user data, leading to degradation in the quality of the received information stream and resulting in inefficient use of bandwidth in the SS7 network.

It is an object of the invention to provide a method and system for exchanging control information between nodes in multimedia networks across a fixed or switched telecommunications network which ameliorates or overcomes one or more disadvantages of the prior art.

It is a further object of the invention to enable nodes in multimedia networks to exchange control information across a fixed or switched telecommunications network.

One aspect of the present invention provides a method for exchanging control information between a first node in a first multimedia network and a second node in a second multimedia network, said first and second multimedia networks being separated by a fixed or switched telecommunications transit network across which control information between said first and second nodes is transported, the method comprising the steps of:

transmitting from said first multimedia network to said fixed or switched telecommunications network a control message containing control information intended to govern the operation of said second node;

at the interface between said first multimedia network and said fixed or switched telecommunications network, mapping said control information into an inband signalling message for transport in a bearer channel within said fixed or switched telecommunications network, and

at the interface between said fixed or switched telecommunications network and said second multimedia network, removing said control information from within said inband signalling message for transmission to said second node.

In this way, the exchange of control messages between nodes in the first and second multimedia networks, which enable notably the end-to-end negotiation of capabilities, is able to be carried out through traditional telecommunications networks, such as those based on SS7 and new telecommunications networks based on call control not being tied to underlying user plane transport, such as the Transport Independent Call Control (TICC) network. The use of transcoders can thus be eliminated, resulting in better speech quality and more efficient use of resources in the networks.

Preferably, the inband signalling message conforms to the GSM Tandem Free Operation (TFO) inband signalling protocol. The inband signalling message may be a TFO Message.

In one embodiment, the control information includes information characterising the capabilities of one or more of said nodes to transmit or receive information streams.

The operation of at least one of said first and second multimedia networks may be based on ITU-T Recommendation H.323. Alternatively, the operation of at least one of said first and second multimedia networks may be based on the IETF RFC 2543 Session Initiation Protocol.

The operation of the fixed or switched telecommunications network may be based on the ITU-T Signalling System No. 7 Recommendation.

Another aspect of the invention provides a system for exchanging control information between a first node in a first multimedia network and a second node in a second multimedia network, said first and second multimedia networks being separated by a fixed or switched telecommunications transit network across which control information between said first and second nodes is transported, the system comprising:

means for transmitting a control message containing control information, intended to govern the operation of said second node, from said first multimedia network to said fixed or switched telecommunications network,

means for mapping said control information, at an interface between said first multimedia network and said fixed or switched telecommunications network, into an inband signalling message for transport in a bearer channel within said fixed or switched telecommunications network, and

means for removing said control information, at the interface between said fixed or switched telecommunications network and said second multimedia network, from within said inband signalling message for transmission to said second node.

The control information mapping and removing means may be provided by one or more gateways, media gateways, rate adaptor units or interworking units interconnecting said first and second multimedia networks to said fixed or switched telecommunications network.

The following description refers in more detail to the various features of the present invention. To facilitate an understanding of the invention, reference is made in the description to the accompanying drawings where the method and system of exchanging control information between nodes in multimedia networks is illustrated in a preferred

embodiment. It is to be understood that the invention is not limited to this preferred embodiment.

In the drawings:

Figure 1 is a schematic diagram of two multimedia networks, based respectively on the H.323 and SIP standards, which are interconnected by a PSTN/ISDN transit network;

Figure 2 illustrates a TFO frame used to transport user information from one multimedia network in Figure 1 to the other across the PSTN/ISDN transit network;

Figure 3 illustrates the insertion of the TFO frame of Figure 2 into 8 bit PCM samples transmitted in the PSTN/ISDN network of Figure 1;

Figure 4 illustrates a TFO message used for the inband signalling of control information from one multimedia network in Figure 1 to the other across the PSTN/ISDN transit network; and

Figure 5 illustrates part of the capabilities negotiation process between endpoints in the two multimedia networks of Figure 1 across the PSTN/ISDN network.

Referring now to Figure 1, there is shown generally a telecommunications system 1 comprising a first multimedia network 2, a second multimedia network 3 and a PSTN/ISDN network 4. The PSTN/ISDN network 4 is a switched network developed for the transmission of voice traffic, whereas both multimedia networks 2 and 3 are designed for the transmission of video, audio and data information streams between nodes within each network rather than to generally to support telephone services. It is to be understood that the operation of multimedia networks 2 and 3 may be based upon the same or different recommendations or modes of operation.

In this example, the operation of the first multimedia network 2 is based upon ITU-T Recommendation H.323, which describes terminals, equipment and services for multimedia communications (voice, video and data) over Local Area Networks (LANs/WANs) which may provide guaranteed Quality of Service (QoS). The H.323 network 2 includes a plurality of H.323 terminals, such as that referenced 5 in Figure 1. The H.323 terminal 5 is an endpoint on the local area network which provides for real-time, two way communications with another H.323 terminal, Gateway, or Multipoint Control Unit. This communication consists of control, indications, audio, moving colour video pictures, and/or data between the two of the aforementioned network nodes. A node may provide speech only, speech and data, speech and video, or speech, data and video. An H.323 Gateway 6 is provided as an endpoint on the local area network, and provides for

real-time, two-way communication between the H.323 terminals on the LAN and other ITU nodes forming part of the ISDN/PSTN network 4.

Similarly, the SIP multimedia network 3 includes a plurality of SIP terminals, such as that referenced 7 in Figure 1. The SIP terminal 7 is an endpoint within the SIP network 3. The SIP Protocol is an application-layer control (signalling) protocol which enables the creation, modification and termination of sessions between one or more nodes within the SIP network 3. These sessions include multimedia conferences, Internet telephone calls and multimedia distribution. A SIP Gateway 8 interconnects the SIP network 3 and the PSTN/ISDN network 4 in order to enable real-time, two-way communication between the SIP terminals in the SIP network 3 and ITU nodes forming part of the ISDN/PSTN network 4.

Terminals within the H.323 network 2 use the ITU-T Recommendation H.245 to exchange information messages as well as procedures to use them for inband negotiation at the start or during communication between two or more such terminals. The messages cover receiving and transmitting capabilities as well as mode preference from the receiving terminal, logical channel signalling, and Control and Indication. Acknowledged signalling procedures are specified to ensure reliable audiovisual and data communication. H.245 information is exchanged between H.323 terminals on a control channel established for the duration of the communication between the terminals.

Terminals within the SIP network 3 use SDP to exchange similar information messages. SDP describes multimedia sessions between two or more terminals and is used to convey session announcement, session invitation and other forms of multimedia session initiation. A common mode of usage is for a multimedia session to be announced by the periodic multicasting of an announcement packet, which consists of a Session Announcement Protocol (SAP) header and text payload describing the multimedia session.

User information is conveyed in the PSTN/ISDN network 4 in 64 kBits/sec links. However, in order to enable one or more nodes in the H.323 network 2 to exchange multimedia information with one or more nodes in the SIP network 3, control information intended to govern the operation of one or more of such nodes during a multimedia session is transported across the network 4 as an inband signalling message within the 64 kBits/sec link. The inband signalling message may conform to the GSM TFO inband signalling protocol. Although this protocol was developed to enable mobile-to-mobile calls to be made in GSM networks without requiring tandem coding to be carried out on the speech

signal, it has surprisingly been found to be suitable for use in the context of the present invention.

Multimedia voice, audio and/or data signals are transported across the PSTN/ISDN network 4 in TFO Frames, an example of which is shown in Figure 2. TFO Frames have a fixed size and length depending on the codec used by the endpoints in each of the multimedia networks 2 and 3. In the TFO Frame 10 of Figure 2, the frame length is 320 bits. The TFO frame 10 includes synchronisation bits in the first two octets, and 21 control bits C1 to C21 which enclose the information payload borne by the Frame. It will be appreciated that the Frame structure shown in this Figure is illustrative only, and that various other Frame structures may be easily conceived by a skilled person in the telecommunications field.

The TFO Frame 10 may be carried by a channel mapped onto one or more bits of the PCM samples of one or more 64 kBits/sec links in the PSTN/ISDN network 4. The number of bits occupied will depend upon the transmission rate of the multimedia information stream transported across the PSTN/ISDN network 4. For example, if the multimedia information stream is transported at a rate of 16 kBits/sec, the TFO Frame 10 may be mapped onto the two least significant bits of the PCM samples, as shown by the PCM sample stream 20 represented in Figure 3.

TFO Messages are transmitted on the same 64 kBits/sec link prior and parallel to the TFO Frames. TFO Messages, an example of which is shown in Figure 4, provide communication channels for conveying control information inside the multimedia information path between respective endpoints in the multimedia networks 2 and 3. The TFO message 30 of Figure 4 includes a header, a command block and possibly one or more extension blocks. The header, in this example, consists of a 20-bit long sequence H1 to H18 (including two "0" bits). The command block, referenced CB1 to CB200, identifies the control information sent between multimedia nodes across the PSTN/ISDN network 4. Extension blocks, here referenced E1 to E20, extend the size of the command block of the TFO message 30.

The TFO message 30 may be transported on the 64 kBits/sec link by being sent together with (embedded into) a TFO Frame 10, or by being inserted into the PCM sample stream 20. In this latter case, the TFO Message 30 may be transferred within the LSB of the PCM sample stream 20 by replacing every 16^{th} consecutive PCM sample with one bit of the TFO Message.

An example of the exchanging of control information between the H.323 endpoint 5 in the H.323 network 2 and the SIP endpoint 7 in the SIP network 3 will now be described with reference to Figure 5. Prior to the establishment of a multimedia session between the endpoints 5 and 7, the endpoint 5 may act to ensure that the endpoint 7 is able to receive and appropriately process the video, audio and/or data information stream it intends transmitting to the endpoint 7. In this case, the endpoint 5 transmits a TerminalCapabilitySet 40 containing information about its capability to transmit and receive. The TerminalCapabilitySet 40 includes a sequenceNumber to label the particular instance of the TerminalCapabilitySet so that a corresponding response from the endpoint 7 can be identified, a protocolIdentifier to indicate the version of the H.245 Recommendation in use, and a CapabilityTableEntry describing, in this case, the capability of the endpoint 5 to send and receive audio using G.723.1 encryption.

The TerminalCapabilitySet 40 is conveyed across the H.323 network 2 to the H.323 gateway 6, which acts to map the TerminalCapabilitySet 40 into a TFO Message 41. The TFO Message 41 has the structure TFO_REQ_L (Codec G7231), indicating that the source of the message is a TFO capable device and that the G.723.1 Audio Codec is the codec used at the endpoint 5. The TFO Message 41 is then transmitted as an inband message within a 64 kBits/sec link across the PSTN/ISDN network 4.

Upon receipt by the SIP Gateway 8, the information contained in the TFO Message 41 is removed and mapped into a SAP Message 42. Accordingly, the protocol version, OwnerSessionID, SessionName and ConnectionInformation are created and placed in a SAP message intended for the endpoint 7. Moreover, information from the TFO Message 41 is able to be mapped into the TimeSessionActive field, the SessionDescription field - sendrecv (corresponding to the receiveAndTransmitAudioCapability transmitted in the H.245 Message 40) - and the MediaAnnoucements field – Audio PORT Transport G7231 (corresponding to the G7231 Audio transmitted in the H.245 Message 40).

Those skilled in the art will appreciate that there may be many variations, modifications and/or additions to the configuration described herein which are within the scope of the present invention.

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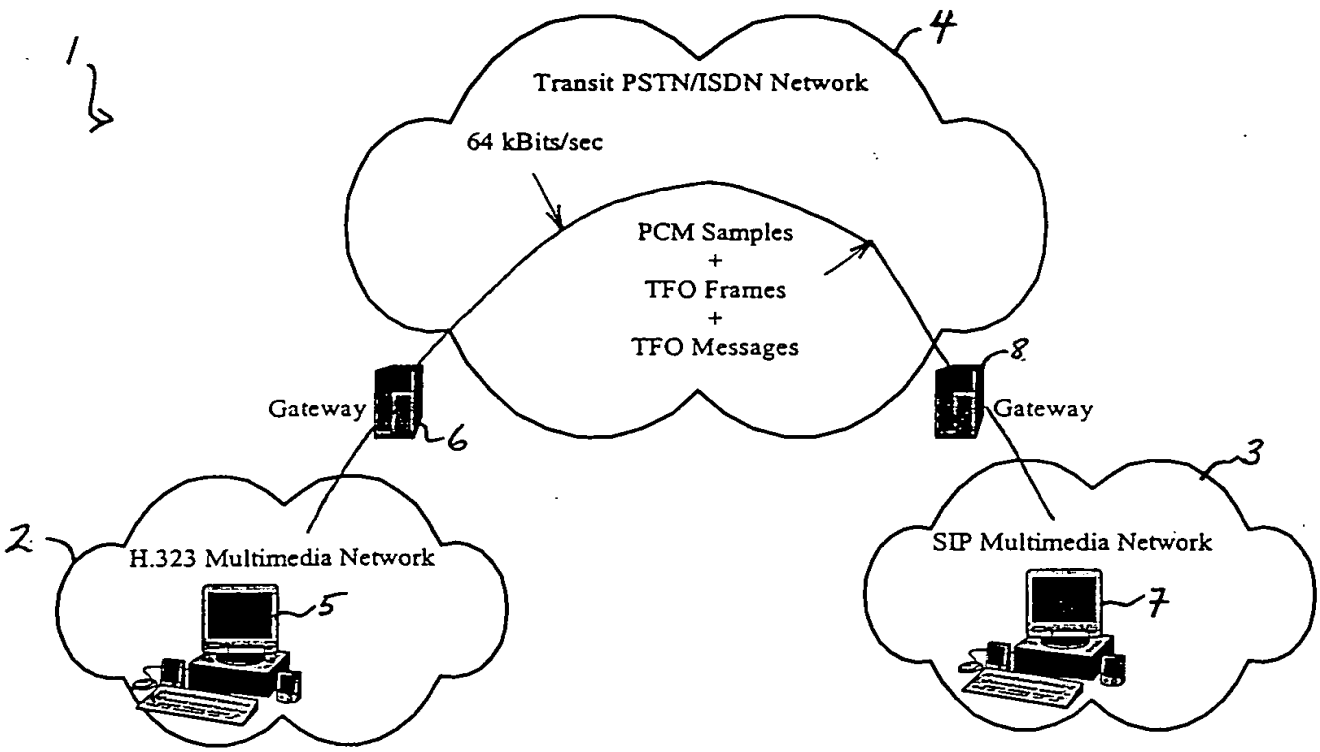

H.245 TerminalCapability (G.723.1)

Capability Negotiation
Protocol indicating:
G723.1 Audio Capability

TFO indicating G.723.1 Audio Capability

SDP (G.723.1 Audio Capability)

FIGURE 1

10

TFO FRAME

OCTET NUMBER	BIT NUMBER							
	1	2	3	4	5	6	7	8
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	1	C1	C2	C3	C4	C5	C6	C7
3	C8	C9	C10	C11	C12	C13	C14	C15
4								
5								
6								
7								
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36								
37								
38								
39	C18	C19	C20	C21	T1	T2	C16 T3	C17 T4

FIGURE 2

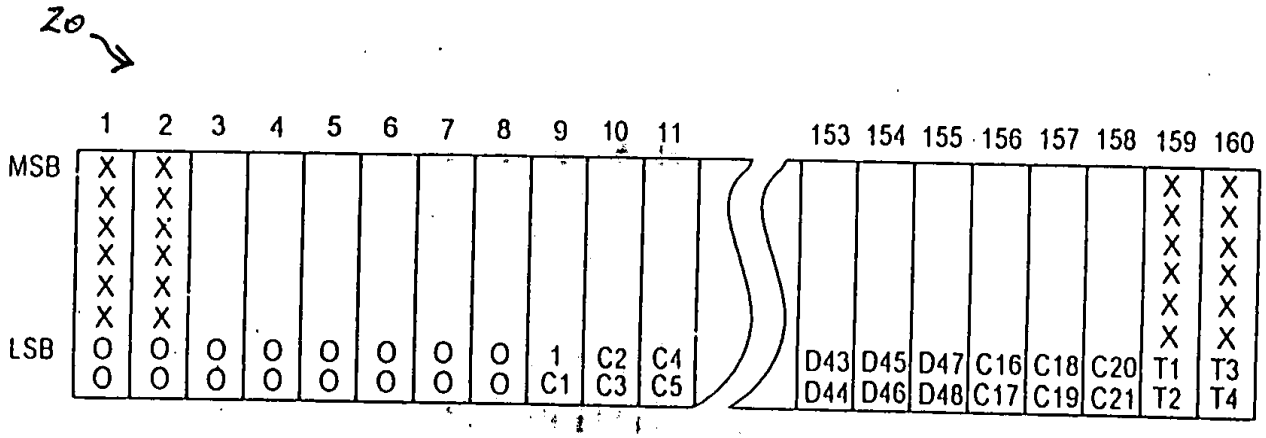
20
1 2 3 4 5 6 7 8 9 10 11
153 154 155 156 157 158 159 160
MSB
LSB
1
C1
C2
C3
C4
C5
D43
D44
D45
D46
D47
D48
C16
C17
C18
C19
C20
C21
T1
T2
T3
T4

FIGURE 3

30

TFO MESSAGE

OCTET NUMBER	BIT NUMBER							
	1	2	3	4	5	6	7	8
0	0	H1	H2	H3	H4	H5	H6	H7
1	H8	H9	0	H10	H11	H12	H13	H14
2	H15	H16	H17	H18	CB1	CB2	CB3	.....
3								
4								
5								
6								
7								
8								
9								
10								
24								
25								
26								
27								
28								
29								
30						.....	CB199	CB200
31	E1	E2	E3	E4	E5	E6	E7	E8
32	E9	E10	E11	E12	E13	E14	E15	E16
33	E17	E18	E19	E20				
34								
35								
36								

FIGURE 4

Examole: Mapping between H.245, TFO & SDP

H245 TerminalCapabilitySet

```
TerminalCapabilitySet                                          40
{
    sequenceNumber      SequenceNumber,
    protocolIdentifier  OBJECT IDENTIFIER,
    capabilityTable     CapabilityTableEntry
                            CapabilityTableEntryNumber,
                            Capability
                                receiveAndTransmitAudio Capability
                                    G7231

}
```

maps to:

TFO

```
TFO_REQ_L (Codec - G7231 - )                                   41
```

maps to:

SDP

```
v=0                                                            42
o=Owner SessionID
s=SessionName
c=ConnectionInformation
t=Time session active
a=sendrecv
m=AudioPORT Transport G7231
```

FIGURE 5